which it preys. Under summer laboratory conditions, probably far from ideal, its development is known to be rapid. The minimum cycle, egg to egg, requires approximately 5 days. The rapid development, coupled with an adult longevity of about 4 weeks and an oviposition rate of 2 or more eggs per day for an undetermined period, indicate that populations of this predator may build up more rapidly than those of the red spiders.

Until such time as the relations between this particular predator and its prey can be expressed in more quantitative terms, the evidence concerning its positive economic value remains inferential.

REFERENCES

Banks, Nathan, 1905. Description of some new mites. Proc. Ent. Soc. Wash., 7 (2-3):133-42.

————, 1915. The Acarina or mites. U. S. Dept. Agr. Rept. No. 108. 153 pp.

Garman, Philip, 1948. Mite species from apple trees in Connecticut. Conn. Agr. Exp. Sta. Bull. 520. 27 pp.

MacGill, E. I., 1939. A gamasid mite (*Typhlodromus thripsi* n. sp.), a predator of *Thrips tabaci* Lind. Ann. Appl. Biol., 26 (2):309-17.

McGregor, E. A., and McDonough, F. L., 1917. The red spider on cotton. U. S. Dept. Agr. Bull. 416. 72 pp.

Oudemans, A. C., 1930. Acarologische Aanteekeningen. CII. Ent. Ber., 8 (172):70.

A NEW SUBSPECIES OF STENELMIS FROM NEVADA

(COLEOPTERA, DRYOPIDÆ)

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Stenelmis calida moapa[1], new subspecies

General: A cylindrical beetle with reddish-brown dorsum, a yellow venter and greenish tinges on the legs. Dorsal color may be broken on elytra by two faint vittæ and darkening anteriorly on pronotum. Size: length 3.1-3.6 mm., width 1.0-1.2 mm.

Head: Round, compact, withdrawn beneath anterior margin of pronotum to posterior eye margins; surface minutely but distinctly tuberculate, tubercles distinctly darker than groundcolor; occiput and face (interocular space) pale (often with a greenish tint), with a distinct reddish vertical bar extending to clypeus; clypeus darker, blue-black, with a wide, distinct, silvery band across entire anterior edge (labroclypeal band) present in both male and female. Labrum similar in color to clypeus, generally darker, the dorsal (upper) border polished, shining black, conspicuous whitish pile rendering remainder more bluish-white;

[1]The following description is based entirely on material examined in alcohol. In dried specimens, the true color pattern is badly obscured by pile and a coating of bluish-white powder.

varying amounts of this pile may be rubbed, leaving either a bare, glistening labrum, or one with a central black band. Mouthparts and 11-segmented antennæ yellow, antennæ slightly shorter than pronotal length; eyes whitish.

Pronotum: Dark brownish-black on edges, disc generally distinctly lighter, brownish-yellow or -red. Surface minutely but distinctly tuberculate, tubercles darker than ground color. Two longitudinal, parallel, weak median carinæ present, bordered laterally on posterior half of pronotum by two large, low, somewhat indistinct tubercules, best seen in a dorsolateral view from the opposite side. Edges sinuate on all four sides, most markedly anteriorly, where the antero-lateral angles are briefly produced into acute angles, the anterior median portion being strongly and smoothly bowed forward over the vertex; lateral edges bisinuate, the anterior sinuosity weaker and shorter, the posterior one strong (but considerably less so than the anterior median sinuosity) and full, producing the greatest width of the pronotum at a point distinctly posterior to the transverse median line—tuberculations of lateral edges give the effect of very weak serrations; postero-lateral angles weakly acute, much less spinous than antero-lateral angles; sinuosity of posterior margin in the form of an unstrung longbow. Base hardly wider than apex.

Elytra: Distinctly multicolored; ground color brownish-black (seen distinctly only in rubbed specimens), obscured by bluish-white pilosity and interrupted by, generally, three lighter brownish vittæ; central vitta weakest, occasionally undiscernible; two lateral vittæ nearly always distinct, extending from just inside umbone posteriorly nearly to apex and following the inner margins of two weak carinæ. Surface punctate, the punctures arranged serially in longitudinal rows, and distinct to apex. Rounded scutellum nearly always distinctly lighter in color than surrounding elytra. Elytra sides parallel to slightly divergent posteriorly. Humeral angles well-rounded. Wings small, non-functional, reduced in length to slightly less than half the elytral length.

Venter: Darker externally, lighter internally. Lateral color generally bluish-black with some traces of whitish pilosity; central color brownish-yellow. Pronotal sides and anterior portion of pronotum strongly bluish-black; prosternum flat, longer than broad, posteriorly free and rounded, slightly truncate or faintly emarginate. Broad metasternum nearly always with a distinct, black, longitudinal median line, crossed by a shorter lateral line near its posterior end, to give the effect of an inverted cross. Occassionally, posterior abdominal segments nearly entirely bluish-black. Entire surface widely tuberculate, tubercles darker than ground color. Apical emargination of abdomen weak to absent.

Legs: From the dorsal aspect of the beetles (which seem almost invariably to die in alcohol with legs in approximately the normal walking posture), the legs have a ground color of light brown generally obscured by bluish-white pilosity or powder; femoral dorsa nearly always lighter in color than tibial dorsa, metafemora usually lighter than other femora. Tibial apices and tarsi yellowish-brown to yellow. Entire leg surfaces closely microtuberculate, appearing mildly serrate along posterior borders by virtue of these tubercles. Tarsal claws each characteristically with a blunt tooth near base on ventral side. Males with diagnostic, weak group of spinules on inner mesotibial margin, two-thirds of distance from proximal to distal end, portion bearing the spinules slightly tumid in contrast to the smooth female mesatibial margin with no sign of swelling. As far as examined, males also possess a very weak row of spinules on internal metatibial margin with no accompanying tumidity, these spinules lacking in the female.

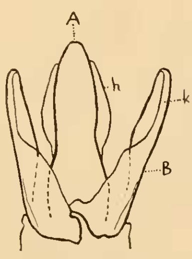
Genitalia: See text fig. 1.

Type locality: Clark County, Warm Springs (Big Pool and its outlet streams), Nevada; December 26-27, 1948; elev. 1700 ft.; (LaRivers & B. H. Banta).

Distribution: In addition to the type locality, *S. calida moapa* has been taken a short distance northward in Lincoln County (Pahranagat Valley—Ash Springs. 28(xii)48, elev. 3750 ft., pH 7.2, temp. 96°F and less, LaRivers & B. H. Banta; Hiko Spring, 29(xii)48, elev. 3800 ft., pH 7.2, temp. 79°F, LaRivers & B. H. Banta). The total distribution known at present lies along a 65 airline-mile portion of an ancient river-course in southeastern Nevada.

Types: In the author's collection; paratypes in the collections of California Academy of Sciences, U. S. National Museum, American Museum of Natural History, British Museum (Natural History) and the Paris Museum.

Stenelmis calida Chandler, while not falling unreservedly into the Sinuata-Humerosa Group as defined by Sanderson, possesses more characteristics of this unit than of the Crenata Group. Mr. Chandler discussed the various aspects of these relationships when describing the species (1949). The following tabular summary will provide a basis for comparison between the two subspecies:



TEXT FIGURE 1. Aedeagus of *Stenelmis calida moapa*, holotype. A, median lobe; B, lateral valve or lobe; h, lateral process of median lobe; k, inner sinuosity of lateral valve.

S. calida calida	*S. calida moapa*
Robust and heavy, "coarse".	Slender and smoother, "delicate."
Tuberculation more pronounced, largely responsible for the rough, coarse appearance.	Tuberculation finer, producing a smoother surface.
Dorsum bicolored, blackish elytra contrasting sharply with the grayish or greenish pronotum (in alcohol).	Dorsum unicolored, various shades of rich brown from blackish to yellowish.
Blackish elytra completely lacking vittæ.	Elytra generally with three vittæ of lighter color, that in the center along elytral union line the faintest.
Pronotum distinctly more "hump-backed" in lateral view.	Pronotum quite rounded, but comparatively more plane.

My chief interest in delineating such subspecific units as *S. c. moapa* lies in a hope that such data will eventually unravel some of the fascinating aspects of the geographic dispersal of Great Basin animals. A study of flightless aquatics seems, at the moment, to be capable of yielding more direct information along these lines since, like fishes, they are quite intimately tied into the dynamics of hydrographic evolution and can be used to supplement, or even initiate, conclusions as to stream and lake origins, movements and durations. In the western Great Basin, in particular, a land of arid valley-remnants of often gigantic Pleistocene lakes, this type of information is particularly important.

By itself, *S. calida calida* is difficult to place, and before the discovery of *S. c. moapa*, I could form no opinion whatsoever as to probable or possible relationships with other members of the genus. Now it seems quite possible that it is a derivative of the Markelii-Convexula Subgroup of the Sinuata-Humerosa Group, which it strongly resembles in genitalia; the vittate condition of the new subspecies removes one of the strongest objections to this concept. While the non-vittate *S. c. calida* still cannot be keyed satisfactorily, the following modification of Sanderson's couplet 15 (1938:684) will readily place the vittate *S. c. moapa:*

15. Lateral processes of ædeagal median lobe as wide as lateral valves or lobes near apex .... *convexula*
    Lateral processes of median lobe about one-half width of lateral valves near apex 16
16. Apices of lateral processes of median ædeagal lobes smoothly curving into body of median lobe at a weak angle distinctly below (i.e., toward base of lobe) point at which lateral valve apices touch the median lobe when appressed to the latter; inner sinuosity of lateral valves not definitely continued to valvular apices .... *markelii*

Apices of lateral processes turning into median lobe rather abruptly at nearly 90° angle approximately opposite or slightly above (i.e., toward lobular apex) point at which lateral valve apices touch median lobe when appressed against the latter; inner sinuosity of lateral valves definitely continued to apices as a reenforced ridge.. *c. moapa*

In addition, *S. markelii* Motschulsky 1854 (described from Tennessee) exhibits a modern distribution which could make it a quite reasonable connecting link between the *Stenelmis* reservoir in the eastern United States and isolated *S. calida* in the southern Great Basin, some 1100 airline miles away, if a southern route of connection across Texas, New Mexico and Arizona is postulated. Until the publication of Mr. Chandler's paper, this area had been a biologic desert as far as *Stenelmis* were concerned, but his recording of *S. bicarinata* from Loving, New Mexico indicates that suitable collecting will radically alter the status of the genus in this area in future.

The flightless *S. c. moapa* has probably been isolated for a considerable period; in line with its present distribution along the remnant streamway of Pleistocene White River in southeastern Nevada, it may have been more widely spread along that watercourse when White River was a continuous stream. Dr. C. T. Brues, in his comprehensive and painstaking fieldwork in western thermal waters, penetrated the White River system at only one point in its northern part—Sunnyside, near the channel of modern White River in extreme northeastern Nye County (the northern half of Pleistocene White River is now known as White River proper—the southern half is the Moapa-Muddy rivers system). His collecting here failed to turn up any *Stenelmis*—or, in fact, dryopids of any kind, so perhaps the species does not occur north of Pahranagat Valley.

The type locality of the new subspecies is an area of remarkable endemism. The beetle seems restricted to thermal waters, and is common in either swift or standing water. Big Pool is an abandoned swimming pool some 90 feet long and 45 feet wide with strong bottom and side springs producing large overflows at both ends of the pool. These overflow streams are swift and shallow, with gravel bottoms and considerable side vegetation, including bare tree roots, among which *S. c. moapa* is common. Pool temperature is 89°F, the pH 7.3, and quite constant, as would be generally expected in predominantly limestone country. The pool is quiet, some six feet deep, and abounds with two native species of fishes, *Crenichthys baileyi* and the recently described cyprinid genus and species *Moapa coriacea* Hubbs & Miller 1948. Temperatures in the outlet streams where the majority of *S. c. moapa* were taken were the same as the pool, the collecting spots being only a few feet downstream.

Of the several distinctive aquatic insects showing strong endemism taken at this locality, *S. c. moapa* exhibited the greatest habitat diversity. In addition to the pool and stream occurrences mentioned, it was found nearby in a small warm-water marsh on a low plateau 15-20 feet higher than the pool. Water in the marsh began at a temperature of 83°F, (pH 7.3), cooling slightly as it meandered through the marsh to the east end where it gathered into a small, swift stream descending the plateau slope to a small meadow, in the center of which it entered the southeast outlet stream of Big Pool some 100 feet down from the pool—at its point of entry, water from the marsh had cooled to 75°F. The marsh and pool-stream systems represented distinct habitats as far as the naucorid population of the area was concerned, but *S. c. moapa* occurred as commonly on the submerged grass and overhanging turf banks of the marsh as in the lower streams.

In lieu of speculations concerning points of entry of *S. calida* into the southern Great Basin, it might be more pertinent to indicate briefly something of the drainage systems of the respective subspecies. The type locality of *S. c. calida* has been discussed by Mr. Chandler, and myself (in press), while I have considered the type locality peculiarities of *S. c. moapa* in several short papers dealing with this and other insects. The most comprehensive reviews and accurate maps are those by Hubbs and Miller (1948) and Miller (1948), and in these they treat the Pleistocene and modern hydrography of the areas involved quite thoroughly. Warm Springs, the type locality of *S. c. moapa*, is a part of the Rio Colorado drainage, being directly connected to that voluminous system by the Moapa and Muddy Rivers—on the other hand, the Ash Meadows locality, type for *S. c. calida*, links with the Amargosa drainage which ends in Death Valley without outlet to the sea. Both subspecies are thermal beetles, and present information indicates them to be isolated even within their respective areas. For example, *S. c. calida* has been found only in the limestone pothole, Devil's Hole, yet there are many other thermal springs nearby in Ash Meadows which would seem to be suitable environments. *S. c. moapa*, while enjoying considerable more habitat diversity at Warm Springs (being found in vegetated, marshy areas as well as in stony situations), has not been found in the cooler waters of the Moapa river, of which Warm Springs are the headwaters. This latter fact can be regarded as of little significance, at the present time, since not enough collecting has been done in these cooler waters to be certain of just what does occur here.

Since these beetles seem pronounced thermophiles, one is led to suspect that low temperatures may have been the chief limiting factor in the northward spread of their parent stock. Thus the only winter temperatures in southern Nevada which were not lethal to immigrants were those of thermal waters, to which they were automatically restricted if they were to maintain themselves. If such a theory be postulated for these beetles, then the parent stock must have been fully winged to allow of initial access. If it is attempted to correlate the spread of the species with the much greater water supplies existent during Pleistocene times when nearly all Nevada basins possessed permanent lakes and streams where one now finds only playas and springs, then the problem of explaining why the species is now absent from cooler waters becomes paramount. If the animal could once spread through cool waters, why is it not now capable of doing so? This is not put forth as an argument, but merely a query. It could have lost the adaptability to cooler waters through no other reasons than genetic changes occurring spontaneously over long periods of time. It might well be that times of extreme drought dried up the streams originating in thermal springs, leaving only the spring waters themselves, which would force the species to take up residence in the springs in order to exist and begin the long change of events which would ultimately thermophilize them.

References

Chandler, Harry P., 1949. A new species of Stenelmis from Nevada (Coleoptera, Elmidæ). Pan-Pac. Ent. 25(3):133-136.

Hubbs, Carl L. and Miller, Robert R., 1948. Correlation between Fish Distribution and Hydrographic History in the Desert Basins of Western United States *IV*. The Great Basin, with Emphasis on Glacial and Postglacial Times. Bull. Univ. Utah, Biol. Ser., 10(6): 17-166.

————1948. Two new relict genera of cyprinid fishes from Nevada. Occas. Papers Mus. Zool. Univ. Mich. No. 507:1-30.

La Rivers, Ira. The meeting point of Ambrysus and Pelocoris in Nevada (Hemiptera: Naucoridæ). Pan-Pac. Ent. (in press).

————. A new species of Microcylloepus from Nevada (Coleoptera: Dryopidæ). Ent. News (in press).

————. A new naucorid genus and species from Nevada (Hemiptera). Ann. Ent. Soc. Amer. (in press).

Miller, Robert R., 1948. The cyprinodont fishes of the Death Valley System of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich. No. 68:1-155.

Sanderson, Milton W., 1938. A monographic revision of the North American species of Stenelmis (Dryopidæ: Coleoptera). Bull. Univ. Kansas 39(11):635-717.